Software Requirements Specification

Software for Dynamic Visualization of Cluster Synchronization in large networks

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# 1.0. Introduction

## 1.1. Purpose

The purpose of this document is to present a detailed description of the software for dynamic visualization of cluster synchronization in large networks. It will explain the purpose and features of the system, the interfaces of the system, what the system will do, the constraints under which it must operate and how the system will react to external stimuli. This document is intended for both the users and the developers of the system and will be proposed to Prof. Sarika Jalan for its approval.

## 1.2. Scope of Project

This software will be designed for usage in complex systems lab to visualize

clustering of nodes according to given initial conditions and parameters provided as input.

It will facilitate the user to see changes in state of the system in the form of Node vs. Node

plot and also enable to see the time evolution of a set of nodes.

## 1.3. References

1) IEEE. *IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications.* IEEE Computer Society, 1998.

# *2) Synchronization in delayed multiplex networks*

http://iopscience.iop.org/article/10.1209/0295-5075/111/30010/meta

## 1.4. Overview

The next chapter, the Overall Description section, of this document gives an overview of the functionality of the product. It describes the informal requirements and is used to establish a context for the technical requirements specification in the next chapter.

The third chapter, Requirements Specification section, of this document is written primarily for the developers and describes in technical terms the details of the functionality of the product.

Both sections of the document describe the same software product in its entirety, but are intended for different audiences and thus use different language.

## 2.0. Overall Description

## 2.1. System Environment

Node vs Node plot

USER

## INPUT OUTPUT

Time evolution of set of Nodes

COMPUTATION

The user provides the input parameters and accordingly Node vs Node plot is generated which depicts the visualization of cluster with an interval of 100 time steps.

The time evolution plot for a set of nodes describes state of selected nodes (set of nodes provided as input by the user) as a function of time.

## 2.2 Functional Requirements Specification

Use Case :: Node vs Node Plot

Step by step description:

1. Values of different coefficients involved in the equation are inserted by the user.
2. Adjacency list file should be placed in same folder as the software.
3. A Node vs. Node plot is generated which shows phase synchronized clusters over a time interval of 100 time steps.
4. The network should be shown in solid dots and cluster points with empty circles.

Use Case :: Time evolution plot

Step by step description:

1. Values of different coefficients involved in the equations are inserted by

the user.

2. Adjacency list file should be placed in same folder as the software.

3. Set of points whose time evolution plot is required is entered by the

user.

4 Time evolution plot is displayed.

1. The points should be showed with empty circles.

## 2.3 User characteristics

User is expected to have to complete knowledge and understanding of input provided.

## 2.4 Non-Functional Requirements

This software runs on a machine that has necessary Python libraries installed (matplotlib and numpy).

Python version should be <= 2.7.9

## 3.0. Requirement Specification

## 3.1 Functional Requirements

|  |  |
| --- | --- |
| **Use Case Name** | Node vs Node Plot |
| **XRef** | Research Paper Reference |
| **Trigger** | Clicks ‘Plot cluster’ button |
| **Precondition** | enters necessary input |
| **Basic Path** | State values of nodes are computed for 100 time steps and appropriate plot is generated using matplotlib. |
| **Post condition** | Node vs Node plot is generated. |

|  |  |
| --- | --- |
| **Use Case Name** | Time Evolution Plot |
| **XRef** | Research Paper Reference |
| **Trigger** | Clicks ‘Plot Time series’ button |
| **Precondition** | User enters set of points to be observed. |
| **Basic Path** | State values of nodes are computed and x(t) vs t plot is generated using matplotlib. |
| **Post condition** | Time Evolution plot is generated. |